

# Perfectionism Dimensions and Research Productivity in Psychology Professors: Implications for Understanding the (Mal)Adaptiveness of Perfectionism

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The consequences of demanding perfection of oneself are hotly debated, with researchers typically arguing for either the adaptiveness or the maladaptiveness of this trait. Research informing this debate involves mainly psychiatric patients, undergraduates, and self-report data, suggesting a need to broaden this relatively narrow evidence base. The present study examines self-oriented perfectionism (i.e., demanding perfection of oneself), conscientiousness, socially prescribed perfectionism, neuroticism, and research productivity in psychology professors. Self-oriented perfectionism was negatively related to total number of publications, number of first-authored publications, number of citations, and journal impact rating, even after controlling for competing predictors (e.g., conscientiousness). Self-oriented perfectionism may represent a form of counterproductive overstriving that limits research productivity amongst psychology professors. Although self-oriented perfectionism is often labeled as adaptive, such statements may be overly general.

*Keywords:* perfectionism, conscientiousness, neuroticism, productivity, academia, professors

The benefits and costs of demanding perfection of oneself are a matter of frequent and spirited debate (e.g., Stoeber & Otto, 2006). Indeed, it is difficult to find a perfectionism researcher who has not commented on this issue. Whereas certain perfectionism dimensions (e.g., concern over mistakes or socially prescribed perfectionism; Frost, Marten, Lahart, & Rosenblate, 1990; Hewitt & Flett, 1991) are generally regarded as maladaptive, the pros and cons of demanding perfection of oneself are open to question and a point of contention.

Two main positions are involved in debate over the (mal)adaptiveness of perfectionism. To some (e.g., Blankstein, Dunkley, & Wilson, 2008), self-imposed perfectionistic strivings and expectations are seen as primarily *adaptive* characteristics associated with positive outcomes (e.g., increased academic achievement). In con-

trast, other authors conceptualize self-imposed perfectionistic strivings and expectations as primarily *maladaptive* characteristics with a high potential to undermine well-being and impede achievement (e.g., Flett & Hewitt, 2006).

## Limitations of Existing Studies

Despite many valuable contributions to this debate (e.g., Owens & Slade, 2008), there is still much to learn about the (mal)adaptiveness of perfectionism. Research on this issue involves a relatively narrow evidence base, with most research using either psychiatric or undergraduate samples. In the present study, we begin to address this limitation by investigating the relationship between perfectionism dimensions and research productivity in psychology professors.

Research productivity is operationalized in terms of total number of publications, number of first-authored publications, number of citations, and journal impact rating. These four variables are important, and substantively different (e.g., Seglen, 1994), contributors to career outcomes such as tenure and promotion (Byrnes, 2007). Most research on the (mal)adaptiveness of perfectionism is solely reliant upon participant self-report and subject to the limitations of this method (e.g., reporting biases). The present study improves on this literature by measuring several objectively verifiable performance indicators (e.g., citations). Our focus on research productivity is also congruent with calls to study perfectionism in relation to a wider range of real world adaptational

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outcomes (Bieling, Israeli, & Antony, 2004). Moreover, little is known about the role of perfectionism in the workplace, making the present research a contribution to an understudied area.

Several prominent measures purporting to assess perfectionism are also saturated with facets of conscientiousness such as self-discipline and organisation (Flett & Hewitt, 2006). This point is apparent when considering items from these measures: "I am very good at focusing my efforts on attaining a goal" (Frost et al., 1990) and "I am an orderly person" (Slaney, Rice, Mobley, Trippi, & Ashby, 2001). Such measures make it difficult to determine whether observed results are linked to perfectionism, conscientiousness, or some combination thereof (Flett & Hewitt, 2006). Failure to differentiate perfectionism from conscientiousness has thusly introduced a sizable degree of uncertainty into the debate regarding the (mal)adaptiveness of perfectionism (Flett & Hewitt, 2006).

### A Model of Perfectionism

Consistent with the prevailing view of perfectionism as a multidimensional construct (Enns & Cox, 2002; Flett & Hewitt, 2002), we studied two key perfectionism dimensions. Self-oriented perfectionism (SOP; i.e., demanding perfection of oneself) involves compulsive striving, unrealistic self-expectations, and a pervasive need for perfection. Socially prescribed perfectionism (SPP; i.e., perceiving others are demanding perfection of oneself) involves exaggerated concerns over others' expectations and perceptions of others as hypercritical (Hewitt & Flett, 1991). Whereas the (mal)adaptiveness of SOP is debated, research consistently indicates SPP is maladaptive (Arpin-Cribbie & Cribbie, 2007; Dunkley & Blankstein, 2000).

Hewitt and Flett's (1991) model was selected because it captures one readily observable distinction in perfectionism research: self-imposed perfectionistic strivings and expectations versus chronic concerns over others' expectations and evaluations (see Chang, 2006). This model also contrasts with other models involving constructs similar to SOP (e.g., Frost et al., 1990; Slaney et al., 2001). In particular, Hewitt and Flett's (1991) model assesses rigid, extreme, and unrealistic strivings and expectations that do not directly reflect conscientiousness.

### Objectives and Hypotheses

Our first objective was to examine the discriminant validity of perfectionism dimensions. We tested whether (a) SOP and conscientiousness, (b) SPP and neuroticism, and (c) SOP and SPP are separate, distinguishable constructs. SOP and SPP are conceptualized as unique lower-order personality traits that differ meaningfully from broader models and measures of personality (Hewitt & Flett, 1991). Consistent with this conceptualization, evidence indicates SOP and SPP are discriminable from five-factor domains (i.e., neuroticism) and from each other (Sherry & Hall, 2009). Drawing on such research, we hypothesised SOP and conscientiousness, SPP and neuroticism, and SOP and SPP represent related, but distinguishable, constructs.

Our second objective was to examine the impact of SOP, conscientiousness, SPP, and neuroticism on research productivity in psychology professors. Although perfectionism is often discussed as a contributor to research productivity (e.g., Feist, 1997; Simonton,

2006), to our knowledge the present study is the first to test this proposed link. We believe the unrealistic self-expectations typical of SOP may prolong task completion (e.g., endlessly revising a journal article). Consistent with this belief, SOP is tied to a fault-finding, inefficient proofreading style (Stoeber & Eysenck, 2008). Evidence also suggests SOP involves a hypercompetitive interpersonal orientation (Hewitt & Flett, 1991) that may complicate team work. Problems in strategically modifying self-expectations across workplace roles may further reduce research productivity; it is hard to be a "perfect" lecturer, supervisor, administrator, and researcher. SOP may also interact with achievement stressors or perceived failures to engender psychological distress that impedes research productivity (Enns & Cox, 2005; Hewitt & Flett, 1993). Building on this work, we hypothesised SOP is related to decreased research productivity.

With regard to SPP, chronic evaluative fears may undermine research productivity by predisposing task avoidance (e.g., not submitting a journal article for review). SPP is also linked to other academic difficulties, including writer's block and statistics anxiety (Walsh & Ugumba-Agwunobi, 2002). The hostile-dominant interactional style often accompanying SPP (Hewitt & Flett, 1991) may further reduce research productivity by eroding collaborative relationships. Research also suggests SPP is tied to ineffective coping that complicates professors' adjustment to daily hassles in academic environments (Dunn, Whelton, & Sharpe, 2006). Based on such theory and evidence, we hypothesised SPP is associated with decreased research productivity.

Our third objective was to test whether SOP and SPP predicted research productivity beyond conscientiousness (i.e., organised, self-disciplined, and goal-directed behaviour) and neuroticism (i.e., a tendency to experience negative emotional states). Several authors (e.g., Enns, Cox, & Clara, 2005) suggest a need to examine the incremental validity of perfectionism dimensions and to test whether lower-order traits (e.g., SPP) explain incremental variance beyond higher-order domains (e.g., neuroticism). Building on research indicating SOP and SPP predict academic outcomes beyond five-factor domains (Page, Bruch, & Haase, 2008), we hypothesised SOP and SPP are linked to decreased research productivity beyond conscientiousness and neuroticism.

Conscientiousness is a suitable control variable because it overlaps with SOP (Sherry, Hewitt, Flett, Lee-Bagglely, & Hall, 2007) and represents a broad personality domain related to positive academic and workplace outcomes (Conard, 2006). Conscientiousness is a robust predictor of job performance and career success (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007), as one might expect of a broad-band personality domain encompassing achievement striving, industriousness, self-control, and orderliness. Conscientiousness thusly represents a benchmark against which to evaluate the incremental validity of SOP and SPP in predicting research productivity. Specifically, conscientiousness was hypothesised to facilitate research productivity—and to contrast with the counterproductive overstriving typical of SOP.

We also included neuroticism as a control variable as this broad personality domain shares variance with SOP and SPP (Sherry & Hall, 2009), encapsulates several maladaptive aspects of personality (e.g., anxiety, hostility, impulsivity, and vulnerability), and predicts various academic and workplace problems (Steel, 2007). Neuroticism is tied to decreased goal-setting and lower motivation in the workplace (Judge & Ilies, 2002). Furthermore, neuroticism

is related to impaired self-regulation in the workplace where on-task attention is undermined by negative and intrusive cognitions and emotions (Smillie, Yeo, Furnham, & Jackson, 2006). Neuroticism was thusly hypothesised to impede research productivity and to represent a potentially confounding factor that we needed to control for in studying the perfectionism–productivity link.

Our fourth objective was to explore if observed links between perfectionism dimensions and research productivity were invariant across women and men. Exploratory analyses of gender differences in perfectionism dimensions are potentially informative, as gender's impact on perfectionism dimensions is unclear and understudied. Moreover, evidence suggests a relatively small gender difference in research productivity amongst psychology professors (with men publishing more; Joy, 2006), but there is no widely accepted explanation for this difference. In seeking to address this gap in knowledge, recent work on gender differences in research productivity has encouraged exploration of gender differences in personality traits tied to research productivity (Ceci, Williams, & Barnett, 2009; Mallinckrodt & Gelso, 2002). Thusly, we decided to test whether, rather than to assume that, our results were invariant across gender.

## Method

### Participants and Procedures

A list of 576 North American graduate programs in psychology was generated from a compendium (see American Psychological Association [APA], 2003). E-mail addresses of 10,246 psychology professors from these graduate programs were gathered from department Web sites. All e-mail addresses were gathered by research assistants who were trained and supervised by the first author. Research assistants gathered e-mail addresses for core faculty (e.g., assistant, associate, or full professors). Core faculty from departments with graduate programs in psychology was focused on because such faculty represents an identifiable group with a broadly similar workplace mandate (e.g., research, teaching, and supervision). Noncore faculty (e.g., cross-appointed professors, postdoctoral fellows, or adjunct professors) are excluded from the present study.

Each psychology professor was sent an 82-word personalized e-mail invitation to participate in the present study by clicking on a web link that directed them to a 51-item Internet-based questionnaire. The Internet-based questionnaire was designed with Dreamweaver MX (2004 Education Version). Extensive pilot testing helped to ensure the Internet-based questionnaire was user friendly. Each professor received one personalized e-mail invitation to participate. In total, 10,246 e-mails were sent to professors and 623 e-mails were returned as undeliverable for various reasons (e.g., the storage capacity of the professor's e-mail account was temporally exceeded). Undeliverable e-mails were corrected through various means (e.g., contacting department office staff to locate the professor's correct e-mail address) and then resent. Of the 623 initially undeliverable e-mails, 559 (89.7%) were eventually sent successfully. No Internet-related technical problems (e.g., server outages) were reported during the course of the present study. To safeguard participants' confidentiality, responses to the Internet-based questionnaire were encrypted when transmitted via the Internet.

A total of 1,258 psychology professors participated in the present study (479 women; 768 men; 11 undeclared), representing a 12.3% response rate. According to the *Digest of Education Statistics* (National Center for Education Statistics [NCES], 2001), roughly 20,000 psychology professors work in psychology departments, and 37.8% are women and 62.2% are men. The proportion of women and men in the present study (i.e., 38.4% women; 61.6% men) thusly represents a reasonable match to the population of psychology professors. Participants in the present study averaged 48.06 years of age ( $SD = 11.27$ ). In a representative sample of 2,972 psychologists, the APA (2007) found that the average psychologist is 50.40 years of age ( $SD = 10.70$ ), which indicates participants in the present study provide a decent match to the population of psychologists. Moreover, 88.7% of participants in the present study were White, 8.8% were members of other ethnic groups (e.g., Asian), and 2.5% did not report their ethnicity. The NCES (2001) reports that 86.5% of professors working in psychology departments are White; this again suggests participants in the present study are a good match to the population of psychology professors. As in past research on psychology professors (e.g., APA, 2003), the vast majority of participants in the present study held at least a PhD. More specifically, 41.2% of psychology professors in the present study held a PhD. and postdoctoral training, 57.7% held a PhD., 0.8% held a MA or BA, and 0.3% did not report their educational level. In studying a representative sample of 865 universities, the NCES (2002) found that 19.9% of social science faculty (including psychology professors) held tenure-track positions and 63.3% of these same faculty held tenure. Similar demographics were observed in the present study, where 22.4% of psychology professors held tenure-track positions and 69.0% held tenure. In addition, 8.3% of psychology professors in the present study reported they did not hold tenure or their institution did not offer tenure, and 0.3% did not report their tenure status. In a normative sample of 919 psychology professors, Joy (2006) reported 27.4% were assistant professors, 27.2% were associate professors, and 42.7% were full professors. Amongst participants in the present study, 24.3% were assistant professors, 24.8% were associate professors, 46.5% were full professors, 1.3% were distinguished professors, 1.7% held other titles (e.g., dean), and 1.4% did not report their academic rank. This suggests participants in the present study represent an adequate match to the population of psychology professors with respect to academic rank.

### Measures

**Multidimensional Perfectionism Scale: Short Form (MPS-SF; Hewitt & Flett, 1991; Hewitt, Habke, Lee-Baggley, Sherry, & Flett, 2008).** Participants completed the SOP (5 items; e.g., "I demand nothing less than perfection of myself") and the SPP (5 items; e.g., "People expect nothing less than perfection from me") subscales of the MPS-SF. Participants indicate their response on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). For scales in the present study, higher scores signify higher levels. Evidence supports the reliability of the MPS-SF subscales (Hewitt et al., 2008). Alpha reliabilities for the MPS-SF subscales usually range from .75 to .85 (Hewitt et al., 2008). In the present study, alpha reliabilities for the SOP and the SPP subscales were .88 and .76, respectively. The 1-week test–retest reliabilities for

the SOP ( $r = .82$ ) and the SPP ( $r = .76$ ) subscales of the MPS-SF appear high (Graham, Sherry, & Stewart, 2009). Research also supports the predictive, incremental, discriminant, and convergent validity of the MPS-SF (Hewitt et al., 2008). For example, the SOP subscale of the MPS-SF is strongly correlated ( $r = .65$ ) with the SOP subscale of the Eating Disorder Inventory (EDI; Garner, Olmstead, & Polivy, 1983; Joiner & Schmidt, 1995) and the SPP subscale of the MPS-SF is strongly correlated ( $r = .72$ ) with the SPP subscale of the EDI. The SOP subscale of the MPS-SF is also strongly correlated ( $r = .91$ ) with the SOP subscale of the original MPS, whereas the SPP subscale of the MPS-SF is strongly correlated ( $r = .90$ ) with the SPP subscale of the original MPS (Hewitt et al., 2008; see also Cox, Enns, & Clara, 2002). Although included in the MPS-SF, other-oriented perfectionism (i.e., demanding perfection of others) was not measured, as research suggests it is unrelated to academic variables (Onwuegbuzie, 2000).

#### **Big Five Inventory (BFI; Benet-Martínez & John, 1998).**

The conscientiousness (9 items; e.g., "I see myself as someone who does things efficiently") and the neuroticism (8 items; e.g., "I see myself as someone who worries a lot") subscales of the BFI were administered. Participants offer their response on a 5-point scale extending from 1 (*disagree strongly*) to 5 (*agree strongly*). Research supports the reliability of the BFI conscientiousness and neuroticism subscales (John & Srivastava, 1999). Alpha reliabilities for the conscientiousness and the neuroticism subscales of the BFI are typically around .75 (Srivastava, John, Gosling, & Potter, 2003). In the present study, alpha reliabilities for the conscientiousness and the neuroticism subscales were .79 and .84, respectively. The 3-month test-retest reliabilities for the conscientiousness and the neuroticism subscales of the BFI are high, ranging from  $r = .80$  to  $r = .90$  (Benet-Martínez & John, 1998). Evidence also supports the convergent, discriminant, incremental, and predictive validity of the BFI (John & Srivastava, 1999). For example, the correlation between the neuroticism subscale of the BFI and the neuroticism subscale of the NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992) is  $r = .76$  and the correlation between the conscientiousness subscale of the BFI and the conscientiousness subscale of the NEO-FFI is  $r = .86$  (Benet-Martínez & John, 1998).

**Publications.** Participants reported how many books, edited books, refereed journal articles, and book chapters they published during their life. Both total publications (e.g., how many books in total) and first-authored publications (e.g., how many books as a first author) were reported. First-authored publications were assessed as persons high in perfectionism may prefer workplace situations where they can be more autonomous and exert greater control (American Psychiatric Association, 2000). Total books, edited books, refereed journal articles, and book chapters were standardised and summed to create a total publications manifest variable (alpha reliability = .81). First-authored books, edited books, refereed journal articles, and book chapters were also standardised and summed to create a first-authored publications manifest variable (alpha reliability = .82).

**Citations.** Participants were asked to "provide the complete APA-style reference for what you know is (or believe is) your most widely cited scholarly output (e.g., refereed journal article, book chapter, etc.)." An APA-style reference was requested so we had enough information to establish an accurate citation count. A total of 899 participants reported their most cited publication.

Citation count for this publication was determined via Web of Science, with the resulting number representing a citations manifest variable. Web of Science is an Internet-based resource representing a comprehensive way to determine how often a given scholarly publication is cited in other scholarly publications (e.g., Kulkarni, Aziz, Shams, & Busse, 2009).

**Impact rating.** According to Garfield (2006), the impact rating for a journal is calculated based on  $X$  divided by  $Y$ , where  $X$  is the number of times articles published during the two previous years were cited (e.g., 526) and  $Y$  is the number of citable articles published during the two previous years (e.g., 133). Based on this example, the impact rating for this journal is 3.955. Research assistants located the impact rating for the journal where the participant's most cited publication appeared. These assistants were trained and supervised by the first author. Using paper, microfilm, and Internet resources from the Science Citation Index, Social Sciences Citation Index, and Web of Science, 571 impact ratings were located, with the resulting number representing an impact rating manifest variable. For instance, if a participant reported that her/his most cited publication appeared in the *Journal of Abnormal Psychology* in 2004, Web of Science was used to determine that the impact rating for this journal in 2004 was 3.281.

## **Data Analytic Plan**

As research suggests that publication frequency, citations, and impact rating are weakly intercorrelated and measure something meaningfully different (e.g., Holden, Rosenberg, Barker, & Onghena, 2006), we analysed each form of research productivity separately. Bivariate correlations were used to examine relationships between personality variables (i.e., SOP, conscientiousness, SPP, and neuroticism) and research productivity. Confirmatory factor analysis (CFA) was used to evaluate the measurement models for total and first-authored publications and discriminant validity analysis tested if personality variables were distinct. Structural equation modelling (SEM) was used to examine the structural models for total and first-authored publications, whereas regression analysis tested if personality variables predicted citations and impact rating. Measurement models, structural models, and regression analyses were also tested to see if they varied across women and men.

## **Results**

### **Means and SDs**

Means and SDs appear in Table 1. Because psychology professors are seldom studied, comparison means from other studies of psychology professors are (to our knowledge) unavailable for the MPS-SF, BFI-N, first-authored publications, citations, and impact rating. However, the average number of total publications reported by psychology professors in the present study is generally consistent with the average number of total publications attributed to a comparable sample of psychology professors (see Joy, 2006). The average number of total publications reported in Joy (2006) is also based on an objective database (i.e., PsycINFO) and not participant self-report. Overall, this suggests that the average number of total publications reported in our study is generally consistent with past research involving comparable samples.

Table 1

Means, SDs, and Bivariate Correlations for Self-Oriented Perfectionism, Conscientiousness, Socially Prescribed Perfectionism, Neuroticism, and Research Productivity

Variables	1	2	3	4	5	6	7	8	M	SD
1. Self-oriented	—	.12***	.50***	.24***	-.10***	-.11***	-.11***	-.08*	17.71	7.16
2. Conscientiousness		—	-.03	-.19***	.09***	.09***	-.04	-.06	35.96	5.51
3. Socially prescribed			—	.29***	-.06*	-.08**	-.07*	-.01	16.21	5.53
4. Neuroticism				—	-.10***	-.10***	-.01	.08*	21.44	6.37
5. Total pub.s					—	.97***	.12***	.08*	51.84	66.81
6. First-authored pub.s						—	.11***	.05	29.88	43.28
7. Citations							—	.25***	113.14	260.60
8. Impact rating								—	3.36	4.18

Note. Self-oriented = self-oriented perfectionism; socially prescribed = socially prescribed perfectionism; pub.s = publications. A bivariate correlation around .10 represents a small effect size; a bivariate correlation around .30 represents a medium effect size; a bivariate correlation around .50 represents a large effect size (Cohen, 1992).

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

### Bivariate Correlations

As Table 1 displays, SOP was positively correlated with conscientiousness, SPP, and neuroticism. Conscientiousness was unrelated to SPP and negatively correlated with neuroticism. In addition, SPP was positively correlated with neuroticism.

SOP, SPP, and neuroticism were all negatively correlated with total and first-authored publications (Table 1). In contrast, conscientiousness was positively correlated with both total and first-authored publications. SOP and SPP were negatively correlated with citations, whereas conscientiousness and neuroticism were unrelated to citations. SOP was also negatively correlated with impact rating; and conscientiousness and SPP were unrelated to impact rating. Unexpectedly, neuroticism and impact rating were positively correlated.

Total and first-authored publications were positively and strongly correlated (see Table 1). Tabachnick and Fidell (2001) maintain that a correlation of this magnitude is suggestive of singularity (i.e., substantial redundancy). Taking a conservative approach, we tested whether our hypothesised results were observed when either total publications or first-authored publications were included in our analyses (see below). As in previous studies (e.g., Holden et al., 2006), all remaining indicators of research productivity were positively, but weakly, intercorrelated (except that first-authored publications and impact rating were unrelated). Research productivity was also correlated with demographics (i.e., age, gender, ethnicity, educational level, tenure status, and academic rank). Demographics are thusly controlled for in predicting research productivity.

In summary, SOP and conscientiousness were differentially related to research productivity in a manner generally consistent with hypotheses. SPP and neuroticism were also negatively related to research productivity (with two exceptions). And results suggested both conscientiousness and neuroticism represent suitable covariates for planned analyses.

### SEM

SEM involved AMOS 7.0 software and maximum likelihood estimation (Arbuckle, 2006). Model fit was evaluated with multiple indicators. A comparative fit index (CFI) and an incremental fit

index (IFI) in the range of .95 along with a root mean square error of approximation (RMSEA) in the range of .06 suggest acceptable model fit (e.g., Hu & Bentler, 1999). RMSEA values are reported with 90% confidence intervals (90% CIs). Model comparisons were conducted using the Akaike information criterion (AIC) and the Browne-Cudeck criterion (BCC). Smaller AIC and BCC values suggest greater parsimony and better fit (Byrne, 2006).

### Measurement Models

CFA examined relations amongst (a) manifest variables and (b) latent variables and their manifest indicators. The measurement model for total publications was composed of four manifest variables (i.e., SOP, conscientiousness, SPP, and neuroticism) and a total publications latent variable composed of four manifest indicators (i.e., total books, total edited books, total journal articles, and total book chapters). Acceptable fit indices were found for this model:  $\chi^2(14, N = 1258) = 21.95$ , CFI = 1.0; IFI = 1.0; RMSEA = .02 (90% CI: .00, .04). Standardised factor loadings for manifest indicators of the total publications latent variable were substantial, significant ( $p < .001$ ), and as follows: .61 for total books, .64 for total edited books, .75 for total journal articles, and .88 for total book chapters. The measurement model for first-authored publications is not presented, as this model was nearly identical to the measurement model for total publications in terms of fit indices, correlations, and factor loadings.<sup>1</sup>

**Gender differences.** Multigroup analyses tested if correlations and factor loadings in the measurement model for total publications varied across women and men. A baseline model was estimated for women,  $\chi^2(14, N = 479) = 13.64$ , CFI = 1.0; IFI = 1.0; RMSEA = .00 (90% CI = .00, .04), and for men,  $\chi^2(14, N = 768) = 17.73$ , CFI = 1.0; IFI = 1.0; RMSEA = .02 (90% CI: .00, .04). The measurement model for total publications was thusly supported in both groups.

A  $\Delta\chi^2$  value is typically used in testing invariance during multi-group analyses. Relative to a  $\Delta\chi^2$  value, a  $\Delta$ CFI value is more robust to nonnormality and more independent of sample size and model

<sup>1</sup> A detailed description of these results is available from the first author upon request.

complexity (Byrne, 2006). If a  $\Delta CFI \leq 0.01$  is seen in multigroup analyses, invariance is said to occur (Cheung & Rensvold, 2002). Based on this criterion, when an unconstrained version of the measurement model for total publications was compared with a constrained version of the measurement model for total publications, invariance in correlations and factor loadings was found across gender. The measurement model for first-authored publications also fit the data well in women and in men and invariance was observed across gender. Multigroup analyses for the measurement model for first-authored publications are not detailed, as these analyses closely resembled multigroup analyses for the measurement model for total publications.<sup>1</sup>

To summarise, the measurement models for total and first-authored publications were identified as well-fitting models that were suitable for additional testing. Correlations and factor loadings for these measurement models were also invariant across women and men.

### Discriminant Validity

Discriminant validity analysis tested whether (a) SOP and conscientiousness and (b) SPP and neuroticism and (c) SOP and SPP are best represented as identical or as distinct variables. These analyses involved model comparisons. Model 1 represented all correlations amongst SOP, conscientiousness, SPP, and neuroticism. Model 2 was the same as Model 1, except the correlation between SOP and conscientiousness was fixed to 1.0 in Model 2. Model 2 therefore treated SOP and conscientiousness as identical. AIC and BCC values suggested Model 1 (AIC = 28.00; BCC = 28.11) fit the data better than Model 2 (AIC = 37.19; BCC = 37.29).

Model 1 was also compared with Models 3 and 4. Model 3 was the same as Model 1, except the correlation between SPP and neuroticism was fixed to 1.0 in Model 3. Model 3 thusly treated SPP and neuroticism as identical. AIC and BCC values indicated Model 1 (see above) fit the data better than Model 3 (AIC = 117.28; BCC = 117.38). Model 4 was also the same as Model 1, except the correlation between SOP and SPP was fixed to 1.0 in Model 4. Model 4 therefore treated SOP and SPP as identical. AIC and BCC values suggested Model 1 (see above) fit the data better than Model 4 (AIC = 356.72; BCC = 356.82). Overall, discriminant validity hypotheses were supported, with results suggesting SOP and conscientiousness, SPP and neuroticism, and SOP and SPP are best represented as distinct, rather than identical, variables.

### Structural Models

Parameters were freely estimated in testing the structural model for total publications (Figure 1). This model fit the data well:  $\chi^2(14, N = 1258) = 21.95$ , CFI = 1.0; IFI = 1.0; RMSEA = .02 (90% CI: .00, .04). Correlations amongst manifest variables indicated SOP was positively related to conscientiousness, SPP, and neuroticism; conscientiousness was unrelated to SPP and negatively related to neuroticism; and SPP and neuroticism were positively related. Congruent with hypotheses, path coefficients indicated SOP and neuroticism were negatively related to publications, whereas conscientiousness was positively related to publications. Contrary to hypotheses, path coefficients suggested SPP was un-

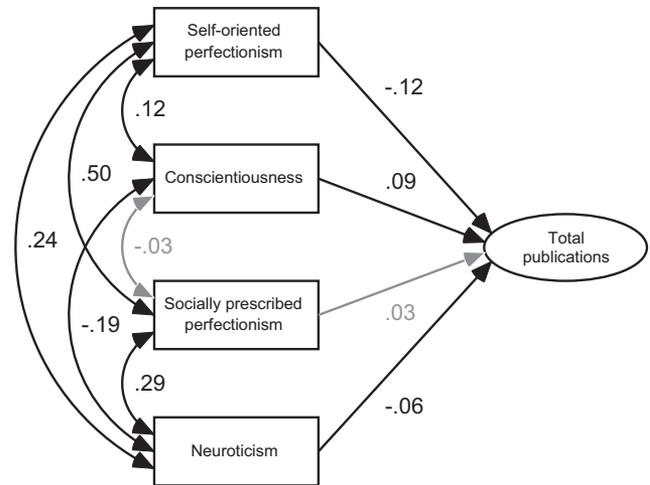


Figure 1. The structural model for total publications. Rectangles represent manifest variables; the oval represents a latent variable. Single-headed arrows represent hypothesised direct effects; double-headed arrows represent correlations. Numbers accompanying single-headed arrows represent standardised path coefficients; numbers accompanying double-headed arrows represent correlation coefficients. Single-headed and double-headed arrows appearing in black represent significant coefficients ( $p < .05$ ). Single-headed and double-headed arrows appearing in grey represent non-significant coefficients ( $p > .05$ ). In the interest of clarity, manifest indicators of the total publications latent variable, error terms, and disturbance terms are not shown.

related to publications. The structural model for first-authored publications is not elaborated on, since this model was highly similar to the structural model for total publications in terms of fit indices, correlations, and path coefficients.<sup>1</sup>

After controlling for demographics, the structural models for total and first-authored publications were largely unaltered with regard to fit indices, correlations, and path coefficients, except neuroticism was no longer related to either total ( $\beta = -.01$ ,  $p > .05$ ) or first-authored publications ( $\beta = .00$ ,  $p > .05$ ). As structural models with many parameters (e.g., demographics) are hard to replicate (Byrne, 2006), we emphasise structural models apart from demographics.

**Gender differences.** Multigroup analyses tested if path coefficients in the structural model for total publications varied across gender. Baseline models for the structural model for total publications fit the data well in women,  $\chi^2(14, N = 479) = 9.90$ ; CFI = 1.0; IFI = 1.0; RMSEA = .00 (90% CI: .00, .03), and in men,  $\chi^2(14, N = 768) = 19.82$ ; CFI = 1.0; IFI = 1.0; RMSEA = .02 (90% CI: .00, .05). In both groups, the structural model for total publications was thusly supported.

A pattern of invariance was observed across women and men when an unconstrained version of the structural model for total publications and a constrained version of the structural model for total publications were compared. The structural model for first-authored publications was identified as a well-fitting model in both women and men and invariance in path coefficients was found across gender. Multigroup analyses involving the structural model for first-authored publications are not discussed in detail because these analyses were highly similar to multigroup analyses involving the structural model for total publications.<sup>1</sup>

In sum, the structural models for total and first-authored publications fit the data well and path coefficients for these models were invariant across gender. As hypothesised, both SOP and neuroticism were negatively linked to publications, whereas conscientiousness was positively linked to publications. SOP (but not SPP) was negatively linked to publications after controlling for conscientiousness and neuroticism, thusly partially supporting incremental validity hypotheses.

### Hierarchical Multiple Regression Analyses With Interactions<sup>2</sup>

Hierarchical multiple regression analyses with interactions were conducted to predict (a) citations and (b) impact rating. Predictors were centered to guard against multicollinearity (Aiken & West, 1991). As Table 2 shows, gender (coded as women = 2 and men = 1) was entered in Step 1. SOP, conscientiousness, SPP, and neuroticism were entered in Step 2 and interaction terms (e.g., SOP × gender) were entered in Step 3. Gender was included in Step 1 to control for its possible influence. Step 2 quantified (a) the proportion of variance incremented by personality variables beyond gender and (b) the extent to which one personality variable affected citations or impact rating when the effects of all other personality variables were constant. Interaction terms in Step 3 also tested if results in Step 2 varied across women and men (Pedhazur, 1997).

As Table 2 displays, gender was negatively related to citations. Consistent with hypotheses, SOP was also negatively related to citations; however, conscientiousness, SPP, and neuroticism were not related to citations in the hypothesised manner. In addition, no significant interactions were found. As Table 2 shows, gender was unrelated to impact rating and, as hypothesised, SOP was negatively related to impact rating. Contrary to hypotheses, neuroticism was positively related to impact rating and conscientiousness and SPP were not related to impact rating. Once again, no significant interactions were observed. These results were also essentially unchanged when controlling for demographics, total publications, or first-authored publications.

In sum, regression analyses indicated that SOP was negatively related to citations and to impact rating after controlling for conscientiousness and neuroticism, thereby providing partial support for incremental validity hypotheses. Neuroticism was positively, and unexpectedly, related to impact rating. All regression analyses were also invariant across gender.

### Discussion

Inferences regarding the (mal)adaptiveness of SOP rest on a relatively narrow evidence base wherein psychiatric patients, undergraduates, and self-report data are overrepresented. The present study broadened this evidence base by investigating a real world adaptational outcome (research productivity) in a largely unexplored population (psychology professors) and by supplementing participant self-report with objectively verified data (citations and impact rating). Using this novel approach, both support for, and discrepancies from, our hypotheses were observed. These results, and their implications, are now considered.

### Implications for Understanding the (Mal)Adaptiveness of Perfectionism

There is a hotly contested debate in perfectionism research, with some authors viewing SOP as primarily adaptive (e.g., Blankstein & Dunkley, 2002) and other authors viewing SOP as primarily maladaptive (e.g., Greenspon, 2000). When situated in this debate, our results support the view that SOP is maladaptive and contradict the view that SOP is adaptive. Although SOP is often labelled as an adaptive trait conducive to achievement outcomes (see Stoeber & Otto, 2006), our results draw into question the common practise of broadly labelling SOP as adaptive and suggest such statements may be overly general. Our results also extend prior research on perfectionism in professors that excluded SOP from consideration, seemingly on the grounds that self-oriented forms of perfectionism in professors are adaptive (Dunn et al., 2006, p. 511).

In ecological niches where clear operational definitions of, and relatively obtainable standards for, perfection are available (e.g., 50 out of 50 on a multiple-choice test in introductory psychology), SOP may, at times, be tied to increased achievement (Enns, Cox, Sareen, & Freeman, 2001). Academic psychology is, however, a different ecological niche. Criticism, scrutiny, and rejection from editors, reviewers, and others (e.g., students) is a common experience for psychology professors. As individuals high in SOP tend to fear failure, avoid criticism, and react negatively to perceived achievement setbacks (Hewitt & Flett, 1991), psychology professors high in SOP may attempt to reduce their exposure to evaluative threats and to achievement setbacks by submitting fewer publications for review, by avoiding risky (but cutting-edge) research that may not succeed, or by submitting to journals with lower impact ratings (see Frost & Marten, 1990). Rigidly demanding perfection of oneself may also stifle scientific creativity, a central element of high impact research, by limiting openness, flexibility, and divergent thinking (Feist, 2006). Diminished productivity amongst individuals high in SOP may also be particularly deleterious to the extent that diminished productivity is associated with negative judgements of self-worth (Barrow & Moore, 1983).

### Self-Oriented Perfectionism and Conscientiousness

Discriminant validity analysis indicated (a) SOP and conscientiousness and (b) SOP and SPP are distinguishable constructs. These results support our discriminant validity hypotheses and Hewitt and Flett's (1991) conceptualization of SOP as a unique lower-order personality trait that is separable both from the higher-order domain of conscientiousness and from SPP.

Consistent with this conceptualization, in the present study, SOP and conscientiousness were differentially related to various indicators of research productivity, with the former impeding and the latter generally facilitating research productivity in female and in male psychology professors. That said, the magnitude of the relationship between personality traits and research productivity was generally small in the present study. Although our observed effect

<sup>2</sup> If the citations manifest variable or the impact rating manifest variable is substituted for the total publications latent variable or the first-authored publications latent variable, the resulting structural model has zero degrees of freedom, thereby precluding estimation of fit indices. SEM was thus not used when testing hypotheses involving citations or impact rating.

Table 2  
*Hierarchical Multiple Regression Analyses With Interactions Predicting Citations or Impact Rating*

Variable	$\Delta R^2$	$\Delta F$	$\beta$
Predicting citations			
Step 1	.02	13.65***	
Gender			-.12*
Step 2	.01	2.83*	
Self-oriented perfectionism			-.11**
Conscientiousness			.00
Socially prescribed perfectionism			-.01
Neuroticism			.04
Step 3	.00	0.40	
Self-oriented perfectionism $\times$ Gender			.01
Conscientiousness $\times$ Gender			-.03
Socially prescribed perfectionism $\times$ Gender			.03
Neuroticism $\times$ Gender			.11
Predicting impact rating			
Step 1	.00	0.32	
Gender			-.02
Step 2	.02	2.46*	
Self-oriented perfectionism			-.11*
Conscientiousness			-.02
Socially prescribed perfectionism			.02
Neuroticism			.10*
Step 3	.01	1.03	
Self-oriented perfectionism $\times$ Gender			.03
Conscientiousness $\times$ Gender			.26
Socially prescribed perfectionism $\times$ Gender			.00
Neuroticism $\times$ Gender			.11

Note. For gender, women = 2 and men = 1.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

sises are similar to past studies on personality traits and research productivity (Mallinckrodt & Gelso, 2002), substantial variance in research productivity was left unexplained in the present study. Having conceded this limitation, we also note that small effects may still be of theoretical importance, such as when SOP and conscientiousness predict similar outcomes in different directions in a manner consistent with hypotheses (outlined in our introduction).

Though small in magnitude, our results join a larger literature indicating SOP and conscientiousness are differentially related to a range of outcomes, with SOP positively tied to, and conscientiousness negatively tied to, depression (Anderson & McLean, 1997; Enns, Cox, & Pidlubny, 2002), suicide behaviours (Hewitt, Flett, & Weber, 1994; Velting, 1999), mortality (Fry & Debats, 2009; Weiss & Costa, 2005), and disordered eating (Chang, Ivezaj, Downey, Kashima, & Morady, 2008; Ghaderi & Scott, 2000). These studies, along with our results, raise concerns about measures (e.g., Frost et al., 1990; Slaney et al., 2001) that assess, but confound, perfectionism and conscientiousness. Such measures are likely to prevent exact tests of hypotheses by overlooking the distinction between perfectionism and conscientiousness.

Our results suggest SOP is a counterproductive form of overstriving that makes a small contribution to decreased research productivity. Female and male psychology professors characterised by self-imposed perfectionistic strivings and expectations appear to publish less frequently, to conduct research that is cited less often, and to publish in lower impact journals. In contrast, conscientiousness appears to increase publication frequency. This result (while small in magnitude) complements research linking

conscientiousness to positive outcomes in academic settings (Conard, 2006) and extends this literature beyond the usually studied population (undergraduates) and criterion (GPA). Conscientiousness was not, however, related to citations or impact rating. A careful, self-controlled, and cautious approach to publishing may increase publication frequency, but not necessarily publication quality (as reflected in citations and impact rating). Alternatively, the influence of conscientiousness on citations or impact rating may only emerge once moderators are specified. Such research is also needed to identify moderators (e.g., stress, ability, burnout or self-efficacy) that increase the strength of the connection between the personality traits we studied and research productivity.

Overall, our results indicate the goal-directed, self-disciplined behaviour typifying conscientiousness differs from the unrealistic strivings and expectations central to SOP. SOP may involve a compulsive need for perfection rather than simply a high need for achievement. Individuals high in SOP appear driven to achieve in a manner that makes it hard to strategically modify or abandon goals or unproductive pursuits that are not working out.

### Socially Prescribed Perfectionism and Neuroticism

Despite consistent evidence suggesting moderate to strong overlap between SPP and neuroticism (Sherry & Hall, 2009), discriminant validity analyses, testing if these constructs are separable, are seldom conducted. We believe the present study is the first to specifically test whether, and to find that, SPP and neuroticism are distinguishable constructs. This finding lends support to our hy-

potheses and also helps to inform prior research on SPP and neuroticism (Enns et al., 2005) by suggesting these constructs are best represented as distinct in spite of their overlap.

As hypothesised, SPP and neuroticism were negatively related to total and first-authored publications in female and in male psychology professors, but these effects were relatively small in magnitude. Compared with SOP and to conscientiousness, SPP and neuroticism were less consistently, less robustly, and less predictably tied to research productivity (especially citations and impact rating). SPP and neuroticism may be less relevant to workplace outcomes such as research productivity (O'Connor & Paunonen, 2007) and more relevant to workplace outcomes such as job satisfaction (Scollon & Diener, 2006). Alternatively, specific facets of neuroticism (e.g., anxiety), rather than the general domain of neuroticism, may be more robustly tied to research productivity. Moreover, other perfectionism dimensions (e.g., concern over mistakes or doubts about actions; Frost et al., 1990), may add incrementally to our understanding of research productivity, and there is already evidence linking these dimensions to difficulties with writing (Frost & Marten, 1990). One unexpected finding involving neuroticism also stands out: namely, neuroticism and impact rating were positively related. We suggest caution in interpreting this finding, while noting neurotic traits and scientific eminence are linked (Feist, 1993).

### **Genders Differences, Perfectionism Dimensions, and Research Productivity**

Results from measurement models, structural models, and regression analyses converged to suggest observed relations between personality variables and research productivity were invariant across women and men. Gender differences in SOP, conscientiousness, SPP, and neuroticism thusly appear unlikely to contribute to the relatively small gender differences in publication rates believed to exist amongst psychology professors, with male professors publishing more frequently (Joy, 2006). Although female professors may experience more pressures and expectations relative to male professors (Rothausen-Vange, Marler, & Wright, 2005), these pressures and expectations may be more culturally based (e.g., gender role expectations contributing to more child rearing responsibilities) as opposed to personality-based.

### **Incremental Validity of Perfectionism Dimensions**

As hypothesised, SOP was negatively related to research productivity over and above conscientiousness, SPP, and neuroticism, thereby supporting the incremental validity of the SOP construct in female and in male psychology professors. In fact, only SOP was linked to citations. This suggests SOP may be uniquely important in understanding citations, a key element of research productivity that is associated with scientific eminence (Feist, 1993). Though the proportion of variance explained was small, our tests of incremental validity are nonetheless notable as research on SOP and achievement outcomes has typically not controlled for established predictors of achievement outcomes such as conscientiousness (for an exception see Enns et al., 2001). Considered alongside our discriminant validity analysis, these results suggest SOP is a unique and a specific lower-order personality trait that is neither captured by nor redundant with

conscientiousness, SPP, or neuroticism, although not all studies clearly support this conclusion (Enns et al., 2005).

Contrary to our incremental validity hypotheses, SPP was unrelated to research productivity above and beyond SOP, conscientiousness, and neuroticism in female and in male psychology professors. Although bivariate correlations suggested some overlap between SPP and research productivity, other variables (e.g., SOP) may better account for this variance. This suggestion is consistent with research indicating SOP involves an extreme focus on achievement outcomes, whereas SPP is more closely tied to social concerns (Hewitt & Flett, 1991).

### **Present Limitations and Future Directions**

Our very low response rate is a significant limitation of our study that raises questions about the representativeness of our sample and the generalizability of our results. Future research might utilise economic incentives and multiple invitations to increase the response rate. That said, with respect to age, gender, ethnicity, educational level, tenure status, academic rank, and research productivity, our participants appear to represent a good match to the wider population of psychology professors.

A sizable proportion of variance in research productivity also remained unexplained in our study, suggesting a need to examine additional predictors of research productivity. For example, research productivity may differ according to the intensity or the supportiveness of research environments. Availability of mentors or formative training experiences (e.g., attending a research-intensive graduate program) may also impact research productivity (Snell, Sorensen, Rodriguez, & Kuanliang, 2009). Future research might test whether a person-environment transaction occurs such that differences in research environments (e.g., teaching load or research facilities) moderate the link between perfectionism dimensions and research productivity.

The present study also relied heavily on participant self-report, meaning our results are potentially influenced by inaccurate recall or other biases such as self-deprecation or self-enhancement. In addition, although participants were not asked to directly report their names on our Internet-based questionnaire, participants did report the reference for their most cited publication. Reporting this potentially identifying information may have influenced how participants responded to other aspects of our study (e.g., measures of personality variables). We also used a circumscribed operational definition of research productivity. Future studies might analyse CVs, which would offer a more objective and encompassing picture of psychology professors' occupational functioning (e.g., grants, teaching awards, and supervision). Citations and impact rating in our study were also based on one publication. More reliable estimates might be obtained in future by calculating these variables based on multiple publications.

### **Concluding Remarks**

The present study yielded novel evidence suggesting female and male psychology professors who strive for perfection and who hold unrealistic self-expectations are less likely to produce publications, receive citations, and publish in high-impact journals. These results inform debate regarding the (mal)adaptiveness of SOP and draw into question the common practise of broadly labelling SOP as adaptive.

## Résumé

Les conséquences d'exiger la perfection de la part de quelqu'un sont chaudement débattues, les chercheurs argumentant typiquement en faveur de l'adaptabilité ou de l'inadaptabilité de ce trait. Les recherches à propos de ce débat impliquent principalement des patients psychiatriques, des étudiants de premier cycle universitaire et des données auto-rapportées, ce qui fait ressortir le besoin d'élargir cette base de données relativement étroite. La présente étude porte sur le perfectionnisme orienté vers soi (c.-à-d., exiger la perfection de soi-même), le caractère consciencieux, le perfectionnisme socialement prescrit, le névrosisme et la recherche de productivité auprès de professeurs de psychologie. Le perfectionnisme orienté vers soi était relié négativement au nombre total de publications, au nombre de publications comme premier auteur, au nombre de citations et au facteur d'impact des revues, même après avoir contrôlé pour l'effet de prédicteurs concurrents (par ex., le caractère consciencieux). Le perfectionnisme orienté vers soi pourrait représenter une forme improductive d'acharnement au travail qui limite la productivité en recherche chez les professeurs de psychologie. Même si le perfectionnisme orienté vers soi est souvent considéré comme étant adaptatif, une telle approche pourrait être trop générale.

*Mots-clés* : perfectionnisme, caractère consciencieux, névrosisme, productivité, université, professeurs

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